APPENDIX B
LLNL ACTIVITY DESCRIPTIONS

IN SUPPORT OF THE
DIRECTED STOCKPILE WORK RESEARCH AND DEVELOPMENT – STOCKPILE SYSTEMS AND STOCKPILE SERVICES
FY 2009 PROGRAM IMPLEMENTATION PLAN

activities. Internal to LLNL, the System Manager interfaces with primary and secondary designers, the system engineer, and other subject matter experts, as well as the Laboratory AAR coordinator, to ensure an accurate integration of activities and assessments to date. A review of assessment activities by the Laboratory-designated Red Team is required.

Risk Identification and Mitigation Strategies: There is low risk to these milestones given the high priority assigned to annual assessment at LLNL. Continuous assessment is a core activity of the Stockpile Stewardship Program. Baseline model maintenance is being conducted; these activities support potential reuse candidates being considered for the future stockpile.

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Level 2 Milestone (MRT 3171): Issue the Annual Assessment Report and Director's Annual Assessment Letter for the W80-0/1.
Due Date: September 2009

Activity Description: This milestone covers two activities: the annual assessment reporting process and the work that is accomplished to support the completion of that reporting process. The assessment of the safety, reliability and performance of the W80 warhead is a continuous process. The scientific basis for that continuous process is the Stockpile Stewardship Program (SSP).

The annual assessment reporting process is accomplished by delivering the annual W80 briefing to the U.S. Strategic Command Stockpile Assessment Team, issuing the W80 annual assessment report and issuing the Director's annual assessment letter. The annual NA-10 tasking letter specifies the major milestones of the annual assessment reporting process. The FY03 National Defense Authorization Act (NDAA) provided specific guidance for this process.

Conduct of the ongoing assessment process is guided by expert judgment and an understanding of the information needed to support the annual assessment reporting process. The activities that support the completion of the reporting process include Design Agency analyses of historical and past-year production surveillance results, the knowledge gained from closure of or work supporting resolution of significant finding investigations, the results of small-scale and integrated tests and experiments, the current state of and progress made in improving baseline models, the knowledge gained from modeling and simulation, the results of studies and any other activities that contribute to understanding the safety, reliability and performance of the W80 warhead. Quantified Margins and Uncertainties (QMU) are to be assessed and reported for weapon performance. The deliverables associated with these activities include the LLNL input to the W80 cycle surveillance report, the LLNL input to the semi-annual NNSA Weapon Reliability Report and meeting significant finding investigation closure plan deliverables.

Level 3 Milestones/Grading Criteria:

Description
1. Submit "Lab," "POG," and "Final" versions of the W80 AAR and prepare/brief the W80 AAR at the SAGSAT review in accordance with cycle 14 instructions, which will be published in January 2009.

Level 3 Milestones/Exit Criteria:

Description	Due Date
1. Issue the AAR and the Director's Annual Assessment Letter for the W80-0/1.	September 2009

Integration/Interfaces: The System Manager interfaces with the W80 project team member at SNL to ensure accurate reporting of joint activities. Internal to LLNL, the System Manager interfaces with primary and secondary designers, the system engineer, the surveillance engineers and other subject matter experts, as well as the Laboratory AAR coordinator, to ensure an accurate integration of activities and assessment to date. A review of assessment activities by the Laboratory-designated Red Team is required. Interfaces are tightly coupled to the activities in milestone MRT 3172.

A wide range of facilities will be required to support the planned baseline activities, necessitating RTBF support. These facilities include; ASC resources for physics, chemistry and engineering analysis, Site 300 engineering ground tests and physics hydrodynamics experiments, HEAF for explosive safety and performance testing plus the surveillance assessment baselining, Superblock for special nuclear materials studies plus surveillance and the LLNL Engineering High Bay where JTA development support, component studies and basic design evaluations are performed.

Risk Identification and Mitigation Strategies: There is low risk to these milestones given the high priority assigned to annual assessment at LLNL. Continuous assessment is a core activity of the Stockpile Stewardship Program.

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Level 2 Milestone (MRT 3172): Identify and complete continuous activities necessary for supporting current/future assessments for the W80-0/1.
Due Date: September 2009

Activity Description: This milestone identifies the baseline system-specific activities not otherwise tied to milestones that remain critical in providing continuous certification of the W80. These efforts provide much of the underlying information to support the annual assessment activities of Milestone 3171. Activities include system and component level testing, simulation of engineering, chemistry and physics performance, and assessment of historical data, including surveillance activities. A summary of baselining and certification activities is presented annually to the Associate Director Weapons and Complex Integration (WCI), scheduled in May of each year to correspond with the Annual Assessment process.

FY09 engineering activities focus in two key areas: system-level assessment (test and analysis) and material studies. System-level assessments are designed primarily to update margin and uncertainty assessments through test or structural analysis. In FY09, system-level tests and analysis activities will be focused on activities as defined by the W80 Assessment Plan. Material assessments will continue in FY09 to investigate the material properties of weapon components, including predictions of aging trends. Advances in assessments developed by the Enhanced Surveillance Campaign and the ADAPT program will be evaluated from the prospective of surveillance rather than reacceptance. Material assessments are joint evaluations requiring engineering and chemistry support. Materials, system, and component aging models will be reviewed and applied to the W80 with an emphasis on understanding the factors that affect the overall uncertainty in predictions based on these models. Specific predictive uncertainties will be reviewed based on best-available W80 aging models. Appropriate resources will be assigned to address and reduce prioritized uncertainties.

The W80-0/1 surveillance process plans to incorporate new testers, which will require Nuclear Explosive Safety (NES) evaluation before use: Eddy current measurement to assess pit tube bending cycles is a candidate for inclusion in the W80 disassembly and inspection (D&I) process, and will require new testers. LLNL will provide NESSG members, and may provide SME's to support the required NES Tester Evaluations.

Surveillance assessments are a valuable component of the evaluation of weapon system health and aging. Assessments will be made based upon data collected in the surveillance cycle, as well as from re-examination of historical data and results will be integrated in the baseline models. Additionally, surveillance activities may indicate areas of focused interest for further examination.

Physics assessment efforts are focused upon accurately assessing the system performance, comprehensively identifying possible failure modes, and quantifying system margins and uncertainties. The process for this is the modeling of UGT data as a baseline validation of the computation, applying the validated model to the system with variations in the inputs to accommodate initial uncertainties, then the identification of

inadequate algorithms, numerical methods, and physical databases, (by QMU), and targeting the those inadequacies for improvement. The W80 A and B Program physicists are currently incorporating data from additional W80 underground tests into the ASC-based baseline models. These efforts employ the ASC staff to aid in problem definition and troubleshooting and will continue to have significant activities in FY09. The primary performance assessments are focused on providing updates to well-defined assessments of yield predictions and related uncertainties. Information from the hydro-test program is incorporated into physics assessments as it becomes available.

LLNL has completed the first phase of the W80 performance assessment plan. This assessment plan has now been used to define and defend the W80 assessments, towards providing confidence in the continued performance of the Nuclear Explosives Package (NEP). The assessment plan also helps prioritize assessments so they may be prepared for and managed by the program.

Specifically, the performance assessment plan will:

1) Define and document our current basis for confidence in performance to satisfy customer requirements. This basis for confidence is the assessments used to develop confidence, rather than the value of the confidence (as quantified with margin and uncertainty) themselves.
2) Define future assessments needed to maintain confidence. These assessments include tests, inspections, analyses, and simulations.
3) Defend the need for these future assessments to maintain confidence.
4) Defend the comprehensiveness of the assessments.

Level 3 Milestones/Grading Criteria:

Description
1. Continue efforts to transition the baseline W80 secondary model to ASC code and compare to the relevant UGT test results. Additional detail is available on the closed side.
2. Continue efforts to update the ASC code model for the W80 primary to calculate ambient, hot and cold performance and compare against the appropriate UGT data. Additional detail is available on the closed side.
3. Continue analysis efforts towards addressing the SFI closeout recommendations.
4. Begin efforts towards quantifying the impact of low preloads on system performance as part of the recently opened Significant Finding Investigation activities.
5. Continue development of chemical, thermal, and radiolytic models to improve understanding of observed aging trends of a weapon component.

Level 3 Milestones/Exit Criteria:

Description	Due Date
1. Provide NA-121.3 with a high-level summary of the activities that were performed including a list of completed supporting reports.	September 2009

Integration/Interfaces: Success in maintaining high confidence in the safety and performance of the W80 relies on close coordination and partnerships with all components of the Stockpile Stewardship Program. Not only must collaboration occur across the complex, especially with SNL and the Production Agencies, but it must also leverage the efforts of LLNL's science/engineering campaigns.

Vital to our Stockpile Stewardship Activities is the continued execution of surveillance transformation activities as well as life storage testing at Y-12. The assured availability of these weapon components allows for assessment of age-related changes from as-built configurations in the W80.

Concurrent campaign activities also have crucial roles in the continued confidence of the W80. Primary Certification Campaign (C-1) and Secondary Certification Campaign (C-4) play a principal role in development and implementation of physics-based models to replace current models that rely on empirical parameters calibrated through UGT data. With stockpile systems evolving away from the tested pedigree, due to aging and/or life extension modifications, these physics-based models combined with surveillance assessments will allow for more predictive assessments of weapon system performance. W80 A and B program physicists are working towards validating these models and incorporating them into the new system baselines.

Weapons Systems Engineering Assessment Technology Campaign (C-6) focuses on increased understanding of age-related performance changes and safety evaluations of HE in a system context. For instance, HE mechanical properties are being collected to construct higher fidelity IHE material models for use in system assessments. W80 engineering analysts are incorporating these new models to develop predictive capabilities, in assessing warhead margins, when exposed to STS temperature cycling and thermal shocks.

ASC (C-11) provides analytical tools, with unique capabilities, for assessing nuclear performance, nuclear safety and thermo-mechanical engineering assessments. ASC support will be critical to the development of the new W80 baseline physics-based models as well as increasing the robustness of engineering codes, particularly as it applies toward addressing a specific SFI recommendation.

Enhanced Surveillance Campaign (C-8) is responsible for the development of lifetime models along with new surveillance diagnostics, which are used to uncover age-related changes in the NEP. Typically, accelerated aging assessments are performed on pits, CSAs, Polymers, IHE, and non-nuclear materials to increase the predictive capability of

these lifetime models. A C-8 aging model under development is key towards addressing a currentW80 watch list item.

A wide range of facilities will be required to support the planned baseline activities, necessitating RTBF support. These facilities include; ASC resources for physics, chemistry and engineering analysis, Site 300 engineering ground tests and physics hydrodynamics experiments, HEAF for explosive safety and performance testing plus the surveillance assessment baselining, Superblock for special nuclear materials studies plus surveillance and the LLNL Engineering High Bay where JTA development support, component studies and basic design evaluations are performed.

NA-122 provides funding to LLNL to perform pit and detonator surveillance evaluations in support of the annual assessment process. In FY09, LLNL will begin evaluation on a pit, with similar characteristics to the W80, from a retired system. In addition, detonator cable assembly (DCA) surveillance will include chemical analysis of the energetics to assess potential age-related changes.

Campaign deliverables through which future W80 assessments will improve are listed in the following table.

Campaign	Deliverable	Date
C1: L2 ID#3092	Provide updated lifetime assessment report for all LLNL pit types (for the Annual Assessment process)	Sep 2009
C1: L2 ID#3088	Analyze additional UGT experiments for LLNL and LANL programs with enhanced tools	Sep 2009
C1: L2 ID#3091	Development of Boost Radiochemistry Capability and Implications for Image Metrics	Sep 2009
C4: L2 ID#3136	Demonstrate the application of energy balance models for stockpile assessment.	Sep 2009
C6: L2 ID#3109	Characterize the as-built stress state of a high-fidelity HE system.	Sep 2009
C11: L2 ID#3236	Improve HED AGEX modeling capability in LLNL's ASC nuclear design code system for validation of models required for the FY10 L1 milestone.	Jun 2009

Risk Identification and Mitigation Strategies: Confidence is high that sufficient assessment and baselining progress will be made at LLNL to support continued certification of the W80 and to support the annual assessment process. Using historical evidence, however, scope of work is often dramatically influenced by outside drivers, including budgetary issues. These outside issues would lead to delays in baselining activities and could degrade confidence in the system, but are difficult to mitigate internally. For example, an updated assessment of detonator performance and reliability was not performed in FY08 due to budget reductions from the baseline FYNSP levels. The risk associated with not performing the current cycle surveillance activities and

associated assessments was mitigated by the elimination of the W80 detonator surveillance backlog in FY07, and plans to perform detonator surveillance in FY09.

RTBF funding issues are an excellent example of potential schedule slip, due to inability to assemble test hardware or perform experiments. In FY06, concerns about the RTBF funding led to overly conservative project plans early in the FY, which were difficult to recover once funding stabilized.

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Integration/Interfaces: The System Manager interfaces with the B83 project team member at SNL to ensure accurate reporting of joint activities. Internal to LLNL, the System Manager interfaces with primary and secondary designers, the system engineer, the surveillance engineers and other subject matter experts, as well as the Laboratory AAR coordinator, to ensure an accurate integration of activities and assessments to date. A review of assessment activities by the Laboratory-designated Red Team is required. Interfaces are tightly coupled to the activities in milestone MRT 3174. A wide range of facilities will be required to support the planned baseline activities, necessitating RTBF support. These facilities include; ASC resources for physics, chemistry and engineering analysis, Site 300 engineering ground tests and physics hydrodynamics experiments, HEAF for explosive safety and performance testing plus the surveillance assessment baselining, Superblock for special nuclear materials studies plus surveillance and the LLNL Engineering High Bay where JTA development support, component studies and basic design evaluations are performed.

Risk Identification and Mitigation Strategies: There is low risk to these milestones given the high priority assigned to annual assessment at LLNL. Continuous assessment is a core activity of the Stockpile Stewardship Program.

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Level 2 Milestone MRT 3174): Identify and complete continuous activities necessary for supporting current/future assessments for the B83.

Due Date: September 2009

Activity Description: This milestone identifies the baseline system-specific activities not otherwise tied to milestones that remain critical in providing continuous certification of the B83. These efforts provide much of the underlying information to support the annual assessment milestone. Activities include component level testing, simulation of engineering, chemistry and physics performance, and assessment of historical data. A summary of baselining and certification activities is presented annually to the Principal Associate Director of Weapons and Complex Integration (WCI), scheduled in May of each year to correspond with the Annual Assessment process.

FY08 B83 DSW activities are focused in four key areas: continued development of a comprehensive weapon assessment plan that was started in FY07, improvement of system engineering models for use with ASC simulation tools in assessing the B83 in STS environments, validation of physics baseline models using 3D ASC physics codes, and investigation of open SFI.

The B83 weapon assessment plan will define and defend the B83 assessments, providing confidence in the continued performance of the Nuclear Explosives Package (NEP). The assessment plan will also help prioritize DSW activities so they may be prepared for and managed by the program.

Specifically, the performance assessment plan will:

1) Define and document our current basis for confidence in performance to satisfy customer requirements. This basis for confidence is the body of work used to develop confidence, rather than the numerical value of the confidence (as quantified with margin and uncertainty as Confidence Factor).
2) Define future assessments needed to maintain confidence. These assessments include tests, inspections, analyses, and simulations.
3) Justify the need for these future assessments to maintain confidence.
4) Justify the comprehensiveness of the assessments.

Since the cessation of SNM JTA flight testing and cable drop impact tests at the Aerial Cable Drop Facility at SNL/NM, assessment of structural performance of the B83 NEP has been relying on computer simulation of validated system engineering model. One of the critical elements of a validated model is the validity of the material models used in the simulation. In FY09, improvement of material models developed in FY08 will be incorporated into the B83 baseline system engineering models. Material characterization will be conducted at Y-12 and material models development will continue. Component tests designed to assess engineering model performance will be performed. Post-test model correlation and validation analysis of the last planned high fidelity JTA-110

4. Continue uncertainty assessment of the primary to support a hydrodynamic experiment.
5. Complete material characterization testing of the mitigator. (Q3 FY 2009)
6. Complete material characterization and development of the material model of NEP metals. (Q4 FY 2009)

Level 3 Milestones/Exit Criteria:

Description	Due Date
1. Provide NA-121.31 with a high-level summary of the activities that were performed including a list of completed supporting reports.	September 2009
2. Material characterization test report.	September 2009
3. Verification analysis report with new material models.	September 2009
4. Project plans or cost estimates from production agencies to implement material and/or subassemblies testing.	September 2009

Integration/Interfaces: A wide range of campaign activities play important roles in the B83 assessment. Primary Certification Campaign elements, (C-1) and Secondary Certification Campaign elements (C-4) that support physics play a large role in physics baseline modeling and analysis as well as continued nuclear assessment relative to surveillance assessments. ASC (C-11) provides analytical tools for assessing nuclear and engineering performance, nuclear safety and environmental analysis. ASC support will be crucial to the development of the ASC-quality baseline secondary model as well as primary design. ASC engineering codes (ParaDyn Suite) are essential for assessment given the limited structural tests for the B83's STS environment. As B83 ASC requirements are identified, they will be submitted to the ASC program. Weapons Systems Engineering Assessment Technology Campaign, C-6, is leveraged with NA-122 activities to obtain an understanding of the engineering performance of the B83 relative to abnormal environments. Enhanced Surveillance Campaign, C-8, supports assessment of the aging characteristics of the NEP including pits, CSAs, HE, and non-nuclear materials as well as development of new surveillance diagnostics.

A wide range of facilities will be required to support the planned baseline activities, necessitating RTBF support. These facilities include: ASC computation facilities for physics and engineering assessment, Site-300 test and fabrication facilities, HEAF, Superblock, LLNL machine shops, and the Engineering Hi-Bay.

NA-122 provides funding to LLNL to perform pit and detonator evaluations to provide current data on the condition of the stockpile in support of the annual assessment process. Taking advantage of the DCA resulting from B83-0 dismantlement, additional detonator surveillance evaluation is planned for FY09.

Campaign deliverables through which future B83 assessments will improve are listed in the following table.

Campaign	Deliverable	Date
C1: L2 ID#3092	Provide updated lifetime assessment report for all LLNL pit types (for the Annual Assessment process)	Sept. 2009
C1: L2 ID#2883	Develop plan for boost experiments at HED facilities	June 2009
C1: L2 ID#3088	Analyze additional UGT experiments for LLNL and LANL programs with enhanced tools	Sept. 2009
C1: L2 ID#3091	Development of Boost Radiochemistry Capability and Implications for Image Metrics	Sept. 2009
C1: L2 ID#3098	Document understanding of Boost	Sept. 2009
C4: L2 ID#2896	Implement a physics-based energy balance model in weapon assessment codes	Sep 2008
C4: L2 ID#2898	Apply the QMU methodology to demonstrate the UQ aggregation methodology to secondary performance	Sep 2008
C8: L2 ID#2762	Complete an Enhanced Surveillance stockpile aging assessment report to support the AAR and LEO	Jul 2008
C11: L2 ID#2935	Deliver a physics-based sub grid model to support energy balance resolution	Mar 2008
C11: L2 ID#2938	Assess adequacy of current models for the initial conditions for boost	Sep 2008

Risk Identification and Mitigation Strategies: Confidence is high that sufficient assessment and baselining progress will be made at LLNL to support continued certification of the B83 and to support the annual assessment process. Using historical evidence, however, scope of work is often dramatically influenced by outside drivers, including budgetary issues. These outside issues would lead to delays in baselining activities and could degrade confidence in the system, but are difficult to mitigate internally.

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that a significant safety issue is not revealed that could have been mitigated by better knowledge of the system. Baseline model maintenance is being conducted; these activities support potential reuse candidates being considered for the future stockpile.

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Level 2 Milestone (MRT 3175): Issue the Annual Assessment Report and Director's Annual Assessment Letter for the W87.
Due Date: September 2009

Activity Description: This milestone covers two activities: the annual assessment reporting process and the work that is accomplished to support the completion of that reporting process. The assessment of the safety, reliability and performance of the W87 warhead is a continuous process. The scientific basis for that continuous process is the Stockpile Stewardship Program (SSP).

The annual assessment reporting process is accomplished by delivering the annual W87 briefing to the U.S. Strategic Command Stockpile Assessment Team, issuing the W87 annual assessment report and issuing the Director's annual assessment letter. The annual NA-10 tasking letter specifies the major milestones of the annual assessment reporting process. The FY03 National Defense Authorization Act (NDAA) provided specific guidance for this process.

Conduct of the ongoing assessment process is guided by expert judgment and an understanding of the information needed to support the annual assessment reporting process. The activities that support the completion of the reporting process include Design Agency analyses of historical and past-year production surveillance results, the knowledge gained from closure of or work supporting resolution of significant finding investigations, the results of small-scale and integrated tests and experiments, the current state of and progress made in improving baseline models, the knowledge gained from modeling and simulation, the results of studies and any other activities that contribute to understanding the safety, reliability and performance of the W87 warhead. Quantified Margins and Uncertainties (QMU) are to be assessed and reported for weapon performance. The deliverables associated with these activities include the LLNL input to the W87 cycle surveillance report, the LLNL input to the semi-annual NNSA Weapon Reliability Report and meeting significant finding investigation closure plan deliverables.

Level 3 Milestones/Grading Criteria:

Description
1. Submit "Lab," "POG," and "Final" versions of the W87 AAR and prepare/brief the W87 AAR at the SAGSAT review in accordance with cycle 14 instructions, which will be published in January 2009.

Level 3 Milestones/Exit Criteria:

Description	Due Date
1. Issue the AAR and the Director's Annual Assessment Letter for the W87.	September 2009

Integration/Interfaces: The System Manager interfaces with the W87 System Manager and the W87 project engineer at SNL to ensure accurate reporting of joint activities.

Internal to LLNL, the System Manager interfaces with primary and secondary designers, the system engineer, the surveillance engineer and other subject matter experts, as well as the Laboratory AAR coordinator, to ensure an accurate integration of activities and assessments to date. A review of assessment activities by the Laboratory-designated Red Team is required. Interfaces are tightly coupled to the activities in milestone MRT 3176.

A wide range of facilities will be required to support the planned baseline activities, necessitating RTBF support. These facilities include; ASC resources for physics, chemistry and engineering analysis, Site 300 engineering ground tests and physics hydrodynamics experiments, HEAF for explosive safety and performance testing plus the surveillance assessment baselining, Superblock for special nuclear materials studies plus surveillance and the LLNL Engineering High Bay where JTA flight testing support, component studies, and basic design evaluations are performed.

Risk Identification and Mitigation Strategies: There is little risk to these milestones given the high priority assigned to annual assessment at LLNL. Continuous assessment is a core activity of the Stockpile Stewardship Program.

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Level 2 Milestone (MRT 3176): Identify and complete continuous activities necessary for supporting current/future assessments for the W87.
Due Date: September 2009

Activity Description: This milestone identifies the baseline system-specific activities not otherwise tied to milestones that remain critical in providing continuous certification of the W87. These efforts provide much of the underlying information to support the annual assessment activities of Milestone 3175. Activities include system and component level testing, simulation of engineering, chemistry and physics performance, per assessment of historical data, and design agency conduct and evaluation of surveillance activities for aging trends. A summary of baselining and certification activities is presented annually to the Principal Associate Director of Weapons and Complex Integration (WCI), scheduled in May of each year to correspond with the Annual Assessment process.

Engineering activities for FY09 will focus in two key areas: system-level assessment (test and analysis) and material studies. System-level assessments are designed primarily to update margin and uncertainty assessments through test or structural analysis. In FY09, system-level tests and analysis activities will be focused on further investigation of warhead safety in impact scenarios and in preparing for a ground-test of a hostile environment, including simulations to evaluate test proposals and preliminary design of the test unit and instrumentation. Material assessments will continue in FY09 to further investigate the material properties of weapon components, including predictions of aging trends. Material assessments are joint evaluations requiring engineering and chemistry support.

Surveillance assessments are an essential component of the evaluation of weapon system health and aging. Assessments will be made based upon data collected in the surveillance cycle, as well as from re-examination of historical data and results will be integrated in the baseline models. Surveillance activities may indicate areas of focused interest for further examination. Additionally, surveillance data and analysis provides the single largest contribution to component lifetime estimates and warhead health.

Physics assessment efforts are focused upon accurately assessing the system performance, comprehensively identifying possible failure modes, and quantifying system margins and uncertainties. The process for this is the modeling of UGT data as a baseline validation of the computation, applying the validated model to the system with variations in the inputs to accommodate initial uncertainties, and data acquired from surveillance. The agreement between the baseline-model applied across relevant data (using QMU) identifies inadequate algorithms, numerical methods, and physical data, thus providing the basis for predictive capability improvements. The W87 A-Program physicists are currently building an ASC-based parallel baseline. This effort employs the ASC staff to aid in problem definition and troubleshooting and will have significant activity in FY09. B-Program performance assessments in FY09 are focused on resolving SFI issues and updating the baseline physics performance model to incorporate higher fidelity geometry and validated improvements in physics data. Information from the hydro-test program is incorporated into physics assessments as it becomes available.

LLNL will review materials, system and component aging models that can be applied to the W87, with an emphasis on understanding the factors that affect the overall uncertainty in predictions based on these models. The risk/benefit effects to be realized by reducing specific uncertainties in predictions based on best-available W87 aging models will also be reviewed and we will assign appropriate resources to address and reduce prioritized uncertainties.

In FY09 LLNL continues to develop a W87 performance assessment plan. FY08 progress was slowed due to funding issues. This assessment plan will define and defend the W87 assessments, providing confidence in the continued performance of the Nuclear Explosives Package (NEP). The assessment plan will also help prioritize assessments so they may be prepared for and managed by the program.

Specifically, the performance assessment plan will:

1) Define and document our current basis for confidence in performance to satisfy customer requirements. This basis for confidence is the assessments used to develop confidence, rather than the value of the confidence (as quantified with margin and uncertainty) themselves.
2) Define future assessments needed to maintain confidence. These assessments include tests, inspections, analyses, and simulations.
3) Defend the need for these future assessments to maintain confidence.
4) Defend the comprehensiveness of the assessments.

FY09 flight test activities will continue to support a revitalized MM III ICBM flight test program including JTA support and unique impact area data gathering capability.

Level 3 Milestones/Grading Criteria:

Description
1. Analyze W87 JTA flight test data and apply the results to the W87 NEP assessment.
2. Perform engineering analysis to enhance the QMU basis of components with critical performance parameters
3. Quantify uncertainties in material definitions for dominant load bearing components in the NEP.
4. Complete cycle surveillance of NEP components, analyze, and document the results
5. Improve the primary performance baseline model QMU by adding a relevant UGT event.
6. Develop a new secondary performance baseline model in an ASC code and reassess secondary performance QMU. Compare this model's results with the modern production code model results.

Level 3 Milestones/Exit Criteria:

Description	Due Date
1. Provide NA-121.3 with a high-level summary of the activities that were performed including a list of completed supporting reports.	September 2009

Integration/Interfaces: Success in maintaining high confidence in the safety and performance of the W87 relies on close coordination and partnership with other components of the Stockpile Stewardship Program. This coordination must occur across the complex, especially with SNL and the plants. Successful implementation and execution of surveillance transformation activities is required to assure continued availability of weapon components for surveillance evaluation. Continuation of life-storage testing at Y-12 is a high priority for W87 lifetime assessments.

A wide range of campaign activities plays important roles in the W87 assessment. Primary Certification Campaign elements, (C-1) and Secondary Certification Campaign elements (C-4), support physics and play a large role in physics baseline modeling and analysis as well as continued nuclear assessment relative to surveillance assessments. ASC (C-11) provides analytical tools for assessing nuclear performance, nuclear safety and environmental analysis. ASC support will be crucial to the development of the ASC-quality baseline secondary model as well as supporting primary design and Engineering code requirements. Weapons Systems Engineering Assessment Technology Campaign, C-6, updates our understanding of the engineering performance of systems relative to their STS environments. Enhanced Surveillance Campaign (C-8) supports assessment of the aging characteristics of the NEP. These assessments include pits, CSAs, HE, and non-nuclear materials as well as development of new surveillance diagnostics. . Nuclear Survivability Campaign (C-7) provides unique support to the W87 in the analysis of survivability requirements unique to its STS. Development of analysis and experimental testing methodologies that cut across traditional physics and engineering boundaries is essential to maintaining confidence in performance in the presence of aging components and age-related changes from as-built configurations. Several unique testing facilities across the complex are required to address nuclear survivability issues with confidence. Methodologies for safety assessments of HE initiation in abnormal environments depend on NSR&D support from NA-122. Computational models with supporting data are needed to provide confidence in weapon response assessments input into the Nuclear Explosive Safety Study process used to authorize facility operations supporting the W87.

A wide range of facilities will be required to support the planned baseline activities, necessitating RTBF support. These facilities include; ASC computation facilities for physics and engineering assessment, Site-300 test and fabrication facilities, HEAF, Superblock, LLNL machine shops, and the Engineering Hi-Bay.

NA-122 provides funding to LLNL to perform pit and detonator evaluations to provide current data on the condition of the stockpile in support of the annual assessment process. In FY08, LLNL completed all evaluations of the W87 Cycle 22 pit. In FY09 analysis of

the data will be rolled into assessments of the health of the W87 in the AAR process funded with FY09 DSW (NA-121) funding.

Campaign deliverables through which future W87 assessments will improve are listed in the following table.

Campaign	Deliverable	Date
C1: L2 ID#3092	Provide updated lifetime assessment report for all LLNL pit types (for the Annual Assessment process)	Sept. 2009
C1: L2 ID#2883	Develop plan for boost experiments at HED facilities	June 2009
C1: L2 ID#3088	Analyze additional UGT experiments for LLNL and LANL programs with enhanced tools	Sept. 2009
C1: L2 ID#3098	Document understanding of Boost	Sept. 2009
C4: L2 ID#TBD	Implement a physics-based energy balance model in ASC- code-system	Sep 2009

Risk Identification and Mitigation Strategies: Confidence is high that sufficient assessment and baselining progress will be made at LLNL to support continued certification of the W87 and to support the annual assessment process. Using historical evidence, however, scope of work is often dramatically influenced by outside drivers, including budgetary issues. These outside issues would lead to delays in baselining activities and could degrade confidence in the system, but are difficult to mitigate internally.

RTBF funding issues are an excellent example of potential schedule slip, due to inability to assemble test hardware or perform experiments. In FY06, concerns about the RTBF funding led to overly conservative project plans early in the FY, which were difficult to recover once funding was stabilized.

Y-12 funding/prioritization concerns affect multiple LLNL W87 activities. Lack of resources at Y-12 holds at risk surveillance D&I and life-storage testing. JTA4 production remains at risk, as well as requests for materials testing. Activities at LLNL could be delayed, pushing some assessments into later years.

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Level 2 Milestone (MRT 3182): Submit Refurbishment Options Discussions and Tables for the FY 2010 Technical Basis for Stockpile Transformation Planning (TBSTP) Document.
Due Date: June 2009

Activity Description: The TBSTP planning process is an important activity that directly impacts future production planning. These options can be driven by changes in system performance or reliability due to aging, changing system requirements or added capabilities such as surety. Options can directly impact needed future production plant capacities and capabilities. Currently, the TBSTP process is an annual process that begins with the laboratories developing TBSTP options and ends with NNSA publication of the P&PD. Major laboratory deliverables are the TBSTP drivers and the Component Description Document (CDD). The CDD describes which parts or assemblies are modified or manufactured for the TBSTP. A key portion of the CDD is the end of life dates for components and subsystems. The CDD also includes look-alike parts to help the production plants estimate the impacts and costs associated with each option and the end of life dates for components and assemblies.

Level 3 Milestones/Grading Criteria:

Description
1. Support the efforts to identify needed changes in content and format that may be required to support the expanded uses of the document.
2. Identify refurbishment options (ROs) in accordance with the scope of the TBSTP document, as developed and agreed by NA-121.3 and the design and production agencies.
3. Support TBSTP planning and technical meetings.
4. Submit for review and comment a draft of required input to the TBSTP document in accordance with the agreements between NA-121.3, NA-122.2, and the design and production agencies by May 15, 2009.
5. Support revisions to the FY 2008 document as required by publication of the Production and Planning Document (P&PD) for FY 2009

Level 3 Milestones/Exit Criteria:

Description	Due Date
1. Submit required input to the TBSTP document in accordance with the agreements between NA-121.3, NA-122.2, and the design and production agencies by June 16, 2009.	June 2009

Integration/Interfaces: This activity depends on the science, engineering and ASC campaigns as well as other parts of DSW R&D and DSW SM. In particular, aging drivers would come from a combination of the *Enhanced Surveillance Campaign*, the *Primary and Secondary Certification Campaigns, Engineering Campaign, ASC, DSW R&D Surveillance* and weapon systems' *Stockpile Systems R&D*.

Risk Identification and Mitigation Strategies: There are two risks of concern that can be strong LEO drivers:

- Unexpected aging phenomena(s) that is/are detrimental to the reliability or performance of a weapons system.
- Unexpected change(s) in system requirements.

Mitigation requires continued investments in conducting surveillance on an adequate number of warheads looking for aging trends, continuous system assessment and a forward looking Enhanced Surveillance Campaign. In addition to looking for system changes, close partnerships with the DoD are required to build an awareness of potential user requirements changes.

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Integration/Interfaces: Key interfaces for this activity are within LLNL and between LLNL and Pantex/LANL/SNL. Within LLNL, integration between B Program, NWE Program, and the various system teams is essential. Further, safety projects in support of activities associated with the Superblock will be coordinated with the Nuclear Materials Technology Program.

Pantex integration will be based on defined priorities (Tech-24). These R&D activities will also require coordination between LANL and SNL to assure completeness of research. These interfaces are maintained mainly through the NSR&D Working Group, but also through other multi-site collaborative efforts.

While the Nuclear Safety R&D project work is closely associated with the Engineering Campaigns (in particular C-6 and C-8 in HE assessments), there are no specific joint deliverables required to meet the NSR&D activity goals or to meet the L2 milestone.

Risk Identification and Mitigation Strategies: NSR&D encompasses a broad spectrum of activities as defined in the FY08 NSR&D Working Group Report and is supported from a wide variety of sources. Assuring that all critical work gets completed and that all sponsors' needs are met requires careful coordination. Clearly, with the limited funds available, certain NSR&D projects will need to be delayed or cancelled – which, if not prioritized correctly, could lead to future impacts upon operations.

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Description	Due Date
1. Provide Closeout Reports for high priority SFIs documenting the analyses and assessments in accordance with the approved baseline closure plans.	September 2009

Integration/Interfaces: Inputs from primary and secondary design and their related Secondary and Primary Certification Campaign elements, C-1 and C-4, provide continuing support for SFI investigations. These campaigns are continuing to update the quality and depth of our assessment of the nuclear performance and nuclear safety over the STS range by applying both legacy and the latest ASC codes, re-evaluating nuclear performance data from the test history, and performing additional sub-system tests (e.g., hydro, engineering, etc.) to update—verify and validate—our assessment of each systems performance. They also provide valuable insight as to the need for new diagnostics, and data required for assessing the stockpile.

Similarly, the Engineering Campaign continues to update our understanding of the engineering performance of systems relative to their STS environments. Information gathered through these assessments provides critical information for resolving SFI issues.

Risk Identification and Mitigation Strategies: Confidence is high that all Design Agency deliverables can be met.

However, success of the surveillance activities requires successful completion of all required surveillance activities at the Production Agencies. Elements outside the control of Surveillance can have a significant impact on their ability to meet SFI closure goals. Changing authorization basis for operations (in particular at Pantex or Y-12), NESS expirations and SS-21 progress, off-site transportation of systems and components, plant funding, and diagnostic deployment can all impact the success and quality of the surveillance activities.

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Level 3 Milestones/Exit Criteria:

Description	Due Date
1. Hydrodynamic tests have been performed, and the test data have been analyzed and documented as specified in the FY 2009.	September 2009

Integration/Interfaces: The National Hydrodynamic Test Plan (NHTP) is a joint LLNL-LANL document that addresses experimental needs of the National Nuclear Weapons Program. This plan contains hydrodynamic experiments that are critical for providing data to guide the annual assessment of the performance and safety of the current stockpile, the development of future stockpile and transformational technologies and the validation of codes and models for increasing predictive capability. The NHTP contains tests that support Stockpile Services as well as Campaigns 1, 2, 4, and Advanced Certification.

Development of the NHTP is a joint effort between NNSA/NA-121.3, LLNL, and LANL that extends over several months. The work by these stakeholders includes developing the major elements to be included in the plan, draft writing and review, and agreement on the final draft before formal submission to NNSA.

Fundamentally, the National Hydrodynamic Test Program performs high-explosive-driven experiments. These experiments provide data essential to Stockpile Services. They play a central role in maintaining and advancing our capabilities in the design and assessment of nuclear weapon performance and safety. In terms of the quality and quantity of data, hydrodynamic experiments are the best available experimental activity to guide the annual assessment of the current stockpile.

The Hydrodynamic Program is integrated with several other NNSA programs areas, such as the Science Campaigns. Data from hydrodynamic tests are delivered to Campaigns 1 and 4 for integration into certification strategies. Material performance data from Campaign 2 are used in the design and analysis of these tests; correspondingly, Campaign 2 uses the data for material model development and validation. Campaign 3 develops the advanced radiography technology required by many hydro experiments. ASC codes, supported by Campaign 11, are used to design hydro tests, which include the experimental setup with diagnostics. The data from these tests are then used to validate ASC code models and to reveal the predictive capability of the code simulations.

At LLNL, the Hydrodynamic Test Program consists of facilities and personnel that provide engineering design, materials fabrication, experiment assembly, and actual execution of high-explosive-driven experiments for Defense Programs, Advanced Conventional Technologies, Homeland Security Programs, and the Department of Defense.

Many of the key facilities are located at Lawrence Livermore Laboratory's remote firing site, Site 300, which is only a 30-minute drive from Livermore. An important facility at Site 300 is the CFF, which has a large volume firing arena, contains a full suite of

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The technical direction and oversight provided by LLNL optimizes the data return from plutonium experiments executed by the M&O contractor at NTS. Additionally, LLNL's plutonium experiments plan relies on programmed LLNL/NTS resources to accomplish the required activities at NTS. Continued coordination between LLNL and LANL is required since we are now sharing NSTec support between JASPER and the Large Bore Powder Gun.

A number of RTBF Facilities are required for the successful completion of the milestone. At LLNL these facilities include: Superblock (B332), Light Gas Guns (B341), Highbay (B131). At NTS these facilities include: JASPER, DAF, BEEF and the 5300 assembly areas.

Campaign	Deliverable	Date
Science	Provide to DSW an advanced Pu EOS by 2010 by completing the defined series of JASPER Pu gas gun experiments.	Sept 2010
Science	Execute planned JASPER experiments.	Sept. 2009
Science	Execute planned PHOENIX experiments.	June 2009
Science	Document current understanding of Boost.	Sept. 2009

Risk Identification and Mitigation Strategies: Active engagement by all entities in the joint LLNL/LANL/NTS fielding organization (JNPO) is required to deliver on this milestone. Effective coordination is essential to ensure that changing program priorities are identified, impacts accessed, managing competing programmatic needs for facilities, and plans adjusted to optimize required data return for resources expended. To mitigate the risks associated with our large-scale experiments at BEEF, LLNL plans to use other funding sources to execute small-scale confirmatory experiments.

The JASPER test bed has expedited testing required remedies to the JASPER control system and trigger system. Future JASPER shot campaigns depend on ongoing development of measurement techniques and methodology at gas guns; however, funding for the B341 guns has been curtailed due to RTBF shortfalls. Gas guns at other facilities (CalTech) will have to be used instead. Finally, JASPER's status as a radiological facility has been changed to a Cat 3 nuclear facility. This change had a severe effect on JASPER's operational availability. The permission to proceed under a JCO will expire in April 2009. Transferring the facility management of NTS facilities to NSTec will present challenges during the last two quarters of FY09.

The FY09 mid-year decrement in funding will place the achievement of a 2014 Predictive Capability Framework pegpost on Initial Conditions for Boost at higher risk of not being met. Because pegposts are sequentially tied together, this delay may also impact the 2015 and 2018 pegposts on Boost that support certification of reuse and advanced surety LEPs. JASPER data is one of the key datasets underlying the development of a modern Pu Equation of State. The entire high priority JASPER dataset was originally planned for completion in FY12. That may now be delayed.

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